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COMPARATIVE PERFORMANCE OF RATING SYSTEMS

THE agency ratings, legal lists, and market ratings we have examined constitute three separate systems for rating corporate bonds. The purpose of the present chapter is to compare the efficiency of the three systems in meeting different investment objectives.

The principal problem that arises in comparing the efficiency of different rating systems is that investors have different objectives and therefore attach different weights to the various attributes of securities outstanding in the market. This means that it is not possible to satisfy all investor requirements fully from any single group of securities or to define any single "best" list that will be entirely satisfactory to all parties. Large investors have one set of requirements, small investors another; and a program appropriate for one group would be inappropriate for others. Thus there is an essential conceptual difficulty involved in comparing the performance of lists of high-grade securities defined by the different rating systems.

For purposes of the present chapter, we shall take our lead from the regulatory authorities, who are faced with the day-to-day problems of selecting securities for the legal lists and of establishing various valuation procedures and rules under which financial intermediaries operate. Although the emphasis changes under different circumstances, the regulatory authorities generally seek to achieve the following objectives:

> The list of eligible securities should be as inclusive as possible (should have maximum coverage by volume).
>
> The volume of securities on the list should be as stable as possible (should be subject to a minimum amount of fluctuation over time).
>
> The list should be as safe as possible (should have minimum default risk).
>
> The returns should be as attractive as possible (realized yields should be a maximum).

Clearly, all of these objectives cannot be satisfied fully in any single list of securities, and hard compromises must be effected in practice. For example, the most inclusive list would comprise all outstanding issues, but such a list would have higher default rates than one selected on the basis of some efficient indicator of bond quality. Again, securities on a stable list would have the desirable feature that, once purchased, they would never have to be sold; but unless such a list were very restrictive as to volume, it would be insensitive to impending defaults. Similarly, a restrictive but relatively unstable list could presumably be designed to avoid heavy defaults, but at the expense of lower realized rates of return. And so on through the categories of investment objectives. Fortunately we are not confronted with the delicate problems of balance and weighting involved in the actual construction of legal lists and other investment standards. Our problem here will be a much simpler one of comparing the extent to which selected lists of securities satisfy the criteria listed above, when each criterion is considered separately.

Because of their official status, the lists selected for special study are issues rated in the first four agency-rating grades (composite ratings I–IV), the legal lists, and equivalent lists of securities rated as high grade by the market. The use of "equivalent" lists throughout most of the analysis enables us to eliminate such disturbances as are caused solely by differences in inclusiveness. The lists have already been compared in earlier chapters with respect to their inclusiveness. The essential question at this point is whether one rating system is superior or inferior to another when both are defined so as to include equally comprehensive lists of securities. Thus a list comprised of all issues in the first four agency-rating grades is one and one-half to five times as inclusive as the legal lists (cf. Tables 27 and 42), and the life-span realized yields are higher (cf. Tables 39 and 51); but the default rates are also generally higher (cf. Tables 33 and 47). By comparing lists equally inclusive as to volume, and confined to issues that both systems judged, we can determine the extent to which such differences are due to the superiority of one rating system or another, or simply to differences in the inclusiveness of the lists.

In the first section of the chapter, the legal lists of three states, and issues in the first four agency-rating grades, are each compared with equally inclusive lists selected on the basis of the market rating. Equivalent groups of bonds selected by the different sys-

tems are compared with respect to stability, safety, and yield. The chapter closes with a comparison of each of the three legal lists with equally inclusive lists selected on the basis of the composite agency rating.

Summary of Findings

Generally speaking, a list that included all issues in the first four agency-rating grades at the beginning of a period was more stable volume-wise than an equally inclusive list selected on the basis of the market rating. Generally speaking also, the legal lists were more stable than their market-selected equivalents. For most of the periods analyzed, the proportion of the total volume of issues initially rated high grade by the market that was still so rated at the end of the period was below the corresponding proportion for issues on the legal lists or rated high grade by the agencies. Since the market rating is extremely sensitive to changing bond market conditions, it was necessary to revise the market-rating standard or yield test frequently when it was used to define a list roughly equivalent to those meeting other tests (cf. Chapter 5).

The extreme sensitivity of the market rating to changing bond market conditions, however, has the advantage of predicting defaults on outstanding issues over short periods. In particular, the quadrennial default rates for issues selected on the basis of the market rating at the beginning of a period were predominantly below those for legal bonds or for issues rated I–IV. Thus the price paid for stability of volume by investors using agency ratings and legal lists is the reduced safety or relative insensitivity of the lists to impending defaults.

Less systematic differences were observed in the default rates covering the life spans of issues from offering to extinguishment. Default rates were higher on legals than on the equivalent groups of market-selected high grades, largely because of the poor performance of rail issues favored by the legal lists. On the other hand, default experience was better for issues in the first four agency-rating grades at offering than for the equivalent group selected by the market, largely because of the instability of the market rating over time.

Yield records of equally inclusive lists of securities during eight-year and longer chronological periods of investment show only minor differences, with the realized returns obtained on the

market-selected lists usually lower than on the legal lists and on issues in the first four agency-rating grades.

Larger and more systematic differences are observed in the yields calculated from offering to extinguishment. When the equivalent lists are selected from all regular offerings since 1920, the average promised and realized yields for high grades chosen by the market are generally below the corresponding averages for legal bonds and for issues in the first four agency-rating grades, and the loss rates are markedly higher (or the capital gain rates are lower). Again the principal explanation for the differences is the instability of the market rating. Yield spreads at offering were lower in periods of market optimism than in periods of market pessimism, and subsequent default experience was usually poor for bonds offered in periods of optimism. Although the agencies and the legal lists were not insensitive to market psychology, they were less sensitive than the market itself. For example, a relatively large proportion of the total volume of issues in the first four agency-rating grades at offering consisted of bonds offered in the early twenties or late thirties, and the default rates and yield experience on such offerings were unusually favorable (cf. Chapter 2). On the other hand, a disproportionately large volume of offerings in the equivalent group selected by the market was offered in the late twenties and not extinguished by 1932, and such offerings were subject to the full impact of the heavy default risks of the Great Depression. Hence their life-span realized yields were on the average lower than those of the corresponding agency-rating list and their loss rates were higher (or their capital gain rates lower).

Comparisons as to default and yield experience between legal bonds and equally inclusive lists constructed from agency ratings show only minor differences that are generally not statistically significant. So far as the record goes, it suggests that the agency ratings were perhaps slightly more sensitive to impending defaults than the legal lists. Promised yields and loss rates on legal bonds were usually higher than on the agency-rating equivalents, so that realized yields were about the same, but neither of these two rating systems was markedly superior to the other, either in these or in other respects.

Market Ratings versus Agency Ratings and Legal Lists

The following section compares the stability, safety, and yield experience of issues on the legal lists, and of issues rated high grade by the investment rating agencies, with equally inclusive lists selected by means of the market rating. Excluded are securities for which market ratings could not be obtained (i.e. issues not rated by the market) and those not rated by the investment agencies. Since the published legal lists are presumed to be virtually complete (cf. Chapter 4, on the nature of the lists), all securities were treated as "rated" with respect to legal status, and none was excluded on that count. The comparisons may therefore be interpreted as based on all issues rated both by the statutory legal tests and by the market, or, in passages pertaining to agency ratings, by the investment agencies and the market.

Comparative Stability

Data on the comparative stability of lists selected by agency and by market ratings are presented in Table 68, and by legal tests and market ratings in Table 69. The tables are similar to Tables 31, 45, and 58 of preceding chapters, except that they cover equally inclusive groups of securities. For example, in constructing Table 68, only issues rated both by the market and by at least one agency at the beginning of a given quadrennial period were included in the comparison for that period. For this jointly rated group the par amount rated I–IV by the agencies and the proportion of the total included in that category were first determined (see the first and second columns of the table). All of the jointly rated outstandings were then arrayed in ascending order by market rating at the beginning of the period, and the volume corresponding to the percent rated I–IV was noted. The boundary of this group is shown in the third column. As the final step, the percent of the par-amount total of issues originally rated I–IV that remained in grades I–IV at the end of the period was calculated, as was the percent still having a yield spread equal to or lower than the corresponding market rating in the third column. At the beginning of 1916, for example, $11.1 billion of the jointly rated outstanding issues fell in the first four rating grades, and comprised 89 percent of the par amount of all jointly rated outstanding issues. In the same year, 89 percent of all jointly rated

TABLE 68—Percent of High-grade Outstandings Still Rated High at End of Four-year Periods of Investment: Agency Selections Compared with Equal Volumes of Market Selections, 1912–43

PERIOD	ISSUES WITH AGENCY RATING I-IV AT BEGINNING OF PERIOD AND ALSO RATED BY THE MARKET		*Market Rating Corresponding to Agency Rating I–IV*[a]	PERCENT IN INDICATED CLASS AT BEGINNING AND END OF PERIOD[b]	
	Par Amount (millions)	*Percent of Rated Bonds*		*Agency Rating I–IV*	*Market Rating Equivalent*
1912–15	$ 7,001.7	93.2%	1.3%	89.2%	81.3%
1916–19	11,065.6	88.9	2.0	93.1	76.5
1920–23	11,815.9	89.8	3.7	93.0	94.3
1924–27	14,209.3	87.6	2.9	98.1	95.5
1928–31	17,712.4	90.0	2.1	85.6	54.5
1932–35	16,950.1	76.9	5.4	79.2	89.6
1936–39	9,276.8	66.9	2.3	73.4	57.2
1940–43	9,298.0	64.7	3.5	98.1	97.9

From special tabulations of the National Bureau of Economic Research: par amount data for all large (straight) corporate issues that were rated both by the market and by at least one investment agency, and for 10 percent of such small issues adjusted quadrennially to universe totals, with issues extinguished during each period excluded.

[a] Among issues rated by both systems, percent indicated in preceding column had yield spread of this amount or less at beginning of period.

[b] That is, the percentage of the par-amount total of issues in indicated class at the beginning of the period (exclusive, in each case, of issues not rated by both systems) that remained in that class at the end of the period.

outstandings had a market rating of 2.0 percent or less, so that issues rated I–IV and those with market ratings of 2.0 percent or less constituted equally inclusive lists of top-grade securities. At the end of the period 1916–19 (specifically, the first quarter of 1920) 93 percent of the par amount of issues originally rated I–IV was still so rated, while only 77 percent of the equivalent list of securities selected by means of the market rating still had a market rating of 2.0 percent or less. Thus a list selected on the basis of market ratings was less stable than one selected according to agency ratings over the period 1916–19. The statistics on legal

TABLE 69—Percent of High-grade Outstandings Still Rated High at End of Four-year Periods of Investment: Legal Lists of Maine, Massachusetts, and New York Compared with Equal Volumes Rated High by the Market, 1912–43

PERIOD	ISSUES LEGAL AT BEGINNING OF PERIOD AND ALSO RATED BY THE MARKET		*Market Rating Corresponding to Legal Group*[a]	PERCENT IN INDICATED CLASS AT BEGINNING AND END OF PERIOD[b]	
	Par Amount (millions)	*Percent of Rated Bonds*		*Legal*	*Market Rating Equivalent*
			Maine		
1924–27	$5,236.8	38.1%	0.5%	95.9%	91.5%
1928–31	6,856.4	41.5	0.5	62.4	34.0
1932–35	6,093.6	27.5	1.0	56.3	65.8
1936–39	2,717.5	19.6	0.5	68.0	36.9
1940–43	3,818.2	26.6	0.6	94.4	92.2
			Massachusetts		
1912–15	1,839.9	17.9	0.2	89.5	67.2
1916–19	3,127.1	27.3	0.4	99.3	46.9
1920–23	3,296,4	28.4	0.7	79.3	98.1
1924–27	3,161.9	23.0	0.4	97.1	88.0
1928–31	4,010.6	24.2	0.3	80.8	24.5
1932–35	4,580.8	23.6	0.7	86.0	47.7
1936–39	4,445.6	34.8	0.9	90.6	39.6
1940–43	5,269.3	40.2	1.3	67.9	94.4
			New York		
1916–19	2,613.5	22.8	0.3	100.0	54.3
1920–23	2,747.2	23.7	0.5	98.5	95.9
1924–27	3,293.3	24.0	0.4	85.8	88.0
1928–31	5,701.2	34.5	0.2	93.4	25.3
1932–35	7,941.0	40.9	1.4	78.1	74.9
1936–39	6,103.3	47.7	1.4	58.7	46.4
1940–43	5,414.9	37.7	1.1	91.5	95.7

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues that were rated by the market, and for 10 percent of such small issues adjusted quadrennially to universe totals, with issues extinguished during each period excluded.

[a] Indicated percent in preceding column had yield spread of this amount or less at beginning of period.

[b] That is, the percentage of the par-amount total of issues in indicated class at the beginning of the period that remained in that class at the end of the period.

status in Table 69 were constructed similarly; in this case, since all issues are either legal or not legal in a given state and year, all were considered as having been rated under that system, and only those not rated by the market were excluded in obtaining a sample of issues rated by both.

Comparison of the percentage changes for issues rated I–IV, issues legal in the several states, and their respective market-rating equivalents reveals roughly similar movements over most of the four-year periods. The market-selected lists, however, were less stable than their corresponding agency and legal groups in three-quarters of the comparisons. The inherent property of the market rating is such that when the market-rating boundary rises from the beginning to the end of a period, stability is relatively low; and vice versa, when it falls, stability is relatively high. Thus for the four periods of declining bond market values covered by Table 68 (see also Tables 8 and 23) the groups selected by market rating were much less stable than those chosen by agency rating. For the other four periods (those over which bond market values moved upward), the percent remaining in the same market-rating class was high (close to 90 percent or above), and in two of these periods, 1920–23, and 1932–35, the market high grades were more stable than the top four agency grades.

The picture is similar in Table 69 except for the period 1932–35, when the market generally improved but the Massachusetts and New York legal lists proved more stable than market-selected high grades. This atypical behavior was caused by the temporary suspension of the earnings test for rail bonds (i.e. the deliberate retention of low-grade issues on the legal lists); when the moratoria were lifted, issues were dropped from the legal lists and the latter promptly became less stable than their market-rating equivalents (New York and Massachusetts, 1940–43). In Maine, where a moratorium on rail earnings was not enacted, the group chosen by market rating was more stable than the legal list in 1932–35; but in both cases the percentage remaining on the list was low.

Additional evidence on the stability of the different lists may be obtained by comparing the percentages of total rated outstandings that were upgraded or downgraded in different years. Averages of the annual percentages of net upgrading and net downgrading (under the two variants explained earlier) are presented in Table 70 for the period 1915–43, when most of the rating

TABLE 70—Average Annual Percent of Upgrading and Downgrading over the Period 1915–43 for Issues Rated by the Agencies, Legal Lists, and the Market

	Agency Rating	LEGAL IN			Market Rating
		Maine	Massachusetts	New York	
	Average Percent of Change				
Upgrading					
Variant I	2.1%	2.0%	1.8%	2.0%	5.6%
Variant II	1.8	3.4	2.6	2.9	5.1
Downgrading					
Variant I	3.5	3.9	1.7	2.0	8.1
Variant II	4.1	3.2	2.3	2.7	7.6
Upgrading and Downgrading					
Variant I	3.1	2.5	1.7	2.0	7.1
Variant II	2.9	3.3	2.5	2.9	6.0
	Number of Years				
Upgrading					
Variant I	8	14	15½	18	12
Variant II	15	15	24	24	19
Downgrading					
Variant I	21	6	13½	11	17
Variant II	14	5	5	5	10

The percentages are based on rated outstandings at the beginning of each year. Since all issues are either legal or not legal in a given state and year, rated outstandings do not differ from total outstandings for the legal lists. Based on total outstandings (rather than rated outstandings) for 1915–43, average upgrading and downgrading under Variant II was 2.8 percent for agency ratings and 5.0 percent for market ratings. The Maine list covers only the years 1924–43; over that period average upgrading and downgrading under Variant II was 2.7 percent for agency ratings, 2.5 percent for Massachusetts legals, 3.3 percent for New York legals, and 6.0 percent for market ratings.

For method of calculating upgrading and downgrading under Variants I and II, and sources of data, see Charts 9, 14, and 19, and related text.

systems were in existence. Since the percentages are based on issues rated under the respective systems, and since the Maine list was not published until late in 1923, the data are not strictly comparable either as to volume or number of years covered, but rough adjustments for those discrepancies show little change (see the note to Table 70). In general, this evidence supports what has been said earlier about the relative stability of the different

lists. On the average, larger percentages of the volume of outstanding issues were upgraded or downgraded by the market than by the investment agencies or the regulatory authorities.

We conclude that the market was usually less stable than the agency ratings and legal lists. When the bond market rose and capital gains occurred, the differences in the stability of the various equivalent groups were usually not pronounced. But when the bond market deteriorated and capital losses, instead of gains, occurred, the agency ratings and legal lists were much more stable than the market.

These findings imply that it would be necessary to revise a yield test frequently to include roughly the same proportion of issues covered by other tests. The fluctuations in the boundary setting off market-selected high from low grades, apparent in the tables, reveal the underlying weakness of a yield or market-rating test, as does the actual experience of the National Association of Insurance Commissioners in applying such a test in recent years (cf. Chapter 5). A further practical difficulty involved in using the market rating as an eligibility test under present conditions is that of obtaining satisfactory market quotations for privately placed issues, a problem also encountered to some extent in applying an agency-rating test. Largely for these reasons, the Insurance Commissioners dropped the yield test and now apply an agency-rating test supplemented by tests based on balance sheet and earnings ratios.

Comparative Safety

Data relating to the comparative safety of lists of high grades selected by agency rating or legal status on the one hand and equally inclusive lists obtained from market ratings on the other are presented in Tables 71 and 72. The data were processed in essentially the same fashion as for the preceding tables on the stability of the lists, except that the market-rating equivalents were determined for each of the three major industry groups rather than for the total of all industries combined, in order to increase the number of independent comparisons that could be made.

Of the twenty-four possible independent comparisons within the industry groupings of Table 71, default rates based on market ratings were lower than those based on agency ratings in thirteen cases, were higher in only five cases, and were equal in six cases. When the six tied comparisons are omitted, there remain eighteen

TABLE 71—Quadrennial Default Rates for Outstandings with High Agency Ratings at Beginning of Periods and for Equal Volumes Rated High by the Market; 1912–43

PERIOD	ALL INDUSTRIES		RAILROADS		PUBLIC UTILITIES		INDUSTRIALS	
	Agency Rating I–IV[a]	*Market Rating Equivalent*	*Agency Rating* I–IV[a]	*Market Rating Equivalent*	*Agency Rating* I–IV[a]	*Market Rating Equivalent*	*Agency Rating* I–IV[a]	*Market Rating Equivalent*
1912–15	7.0%	6.2%	7.1%	6.3%	0.0%[b]	0.0%[b]	0.0%[b]	0.0%[b]
1916–19	3.3	2.5	1.5	0.6	9.0	7.9	0.3	0.3
1920–23	0.6	0.6	0.6	0.6	0.7	0.0	0.8	1.7
1924–27	1.0	0.6	0.3	0.0	0.7	0.0	3.2	3.1
1928–31	1.3	0.9	0.9	0.1	1.2	1.0	2.7	2.8
1932–35	6.1	4.9	10.5	10.1	1.5	0.5	7.2	2.3
1936–39	3.1	3.6	6.1	6.3	0.8	1.8	1.1	1.1
1940–43	0.4	0.5	0.4	0.0	0.5	1.0	0.0	0.0

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues that were rated both by the market and by at least one investment agency, at beginning of respective periods, and for 10 percent of such small issues adjusted quadrennially to universe totals.

[a] Rates differ from those given in Table 35 in being based only on issues rated by both of the systems compared here.
[b] Based on less than five issues.

independent pairs of default rates; and the probability that one particular set of default rates in these eighteen pairs will exceed the other set in thirteen or more comparisons is just at the threshold of statistical significance.[1] We conclude that market ratings are quite probably more sensitive to impending defaults over short periods than agency ratings, in the sense that the quadrennial default rates of the best group of issues selected under the one system were lower than those selected under the other. It must be admitted, however, that statistical significance under the test applied here does not necessarily imply practical significance, since a small difference in the default rates in favor of one system of ratings or another is treated as though it were as important as a large difference. In fact, in seven of the eighteen comparisons, the differences were smaller than 0.5 percent, or so small as to be of questionable practical significance. Moreover, examination of the default rates for the most recent periods suggests that the market may have become less sensitive to impending defaults with the passage of time. Thus of the five cases in which the default rates for the agency selections were lower than those for the market-rating equivalents, three occurred in the last two periods covered by the table. Except in those periods, the market appears to have been comparatively more successful in the rail and utility fields than in the industrial.

[1] That is, a "sign test" was applied by subtracting the default rates for the market-rating equivalents from the default rates for the agency-rating lists and by noting the number of times that plus and minus signs occurred. The probability of obtaining thirteen or more plus signs out of eighteen, on the hypothesis that plus and minus signs are equally likely, is 0.048, a probability low enough to raise a doubt as to the reasonableness of the hypothesis that the two events are equally likely.

Some readers may be puzzled by our decision to ignore the ties when applying the sign test, since the usual practice in empirical economic research has been to treat half as pluses and half as minuses. W. J. Dixon and A. M. Mood's "The Statistical Sign Test," *Journal of the American Statistical Association,* 1946, Vol. 41, p. 558, recommends that procedure; but in *An Introduction to Statistical Analysis* (New York, 1950), p. 248, W. J. Dixon and F. J. Massey propose that ties be omitted. In neither source is an explanation given.

The effect of omitting the ties is to increase the power of the test at a given level of significance. The principle involved is that, given two tests having the same probability of rejecting the nul hypothesis when it is true (Type I error), that one should be selected which has the lower probability of accepting the nul hypothesis when it is false (Type II error). A rigorous proof that the sign test with ties omitted is at least as powerful a test at a given level of significance as when the ties are equally distributed is given by J. Hemelrijk in "A Theorem on the Sign Test when Ties are Present," *Proceedings Koninklijke Nederlandse Akademie van Wetenschappen,* Amsterdam, 1952, Series A, Vol. 55, pp. 322-26.

TABLE 72—Quadrennial Default Rates for Outstandings Legal in Maine, Massachusetts, and New York at Beginning of Periods and for Equal Volumes Rated High by the Market; 1912–43

PERIOD	ALL INDUSTRIES		RAILROADS		PUBLIC UTILITIES		INDUSTRIALS	
	Legal[a]	*Market Rating Equivalent*	*Legal*[a]	*Market Rating Equivalent*	*Legal*[a]	*Market Rating Equivalent*	*Legal*[a]	*Market Rating Equivalent*
				Maine				
1924–27	0.4%	0.0%	0.0%	0.0%	1.5%	0.0%		
1928–31	0.0	0.0	0.0	0.0	0.0	0.0		
1932–35	4.1	0.8	9.4	1.8	0.0	0.0	0.0%	0.0%
1936–39	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.0
1940–43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Massachusetts				
1912–15	0.0	0.0	0.0	0.0	0.0	0.0		
1916–19	0.0	0.0	0.0	0.0	0.0	0.0		
1920–23	0.0	0.0	0.0	0.0	0.0	0.0		
1924–27	0.0	0.0	0.0	0.0	0.0	0.0		
1928–31	0.0	0.0	0.0	0.0	0.0	0.0		
1932–35	1.2	1.1	1.9	1.8	0.0	0.0		
1936–39	8.0	1.0	11.6	1.5	0.0	0.0		
1940–43	0.0	0.0	0.0	0.0	0.0	0.0		
				New York				
1916–19	0.0	0.0	0.0	0.0	0.0	0.0		
1920–23	0.0	0.0	0.0	0.0	0.0	0.0		
1924–27	5.3	0.0	5.3	0.0	0.0	0.0		
1928–31	0.1	0.0	0.1	0.0	0.0	0.0		
1932–35	5.8	2.1	8.0	2.9	0.0	0.0		
1936–39	4.3	4.1	5.9	5.8	0.0	0.0		
1940–43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues that were in good standing and rated by the market at beginning of respective periods, and for 10 percent of such small issues adjusted quadrennially to universe totals.

[a] Rates differ from those given in Table 48 in being based only on issues rated by the market.

As has been indicated earlier, the legal lists include a much smaller volume of securities than a list comprised of issues in the first four agency-rating grades. As a result, quadrennial default rates for legal bonds and their market-rating equivalents are usually well below those for the agency ratings and their market-rating equivalents. In fact, too few defaults occurred on legal bonds to permit a reliable statistical comparison. Nevertheless, in eight of the nine instances in which defaults occurred on legal bonds or their market-rating equivalents within the major industry groupings, the comparisons ran in favor of the market ratings and against the legal lists (Table 72). The comparisons are not easily tested statistically in this case since the paired rates are not independent of one another (i.e. certain of the rates reflect the experience of issues legal in more than one state). But the differences, when they occur, are usually so substantial as to leave little doubt that the market was more sensitive to impending defaults over short periods than the legal lists. The relative insensitivity to default of the legal lists and of a list selected on the basis of agency ratings is the price paid for their greater stability. Since relatively small amounts over a given short period were deleted from the legal lists or dropped below grade IV, the default record is poorer for them than for equally inclusive lists selected on the basis of market ratings.

The sensitivity of market ratings on outstanding issues to short-run default risk probably arises largely from the flexibility of market quotations. The market is continuously revising its ratings upward or downward on the basis of the most recent information; but the legal lists and the agency ratings are revised intermittently, and are not so prompt in reflecting the latest information. On the other hand, the very flexibility of market ratings constitutes a serious weakness when they are applied as an invariant standard for the selection of securities over a long period. The market rating provides a sensitive yardstick for ranking issues in order of default risk at any given moment; but the yardstick is elastic, expanding and contracting with investor confidence. It follows that the quality of issues meeting any fixed yield standard may vary inversely, and the volume may vary directly, with the degree of optimism of the market.

As we saw in Chapter 5, life-span default rates on total offerings during 1900–1943 were related inversely to quality as judged by the market, thus indicating that the market rating was sufficiently

stable over the full period studied to serve as a useful predictor of the risk of default. The question remains, however, whether the market, the agency ratings, or the legal lists were superior in this respect.

TABLE 73—Proportions of Offerings 1908–43 That Went into Default before 1944: Agency Selections and Legal Lists Compared with Equal Volumes Rated by the Market

	OFFERINGS RATED BY BOTH AGENCY AND MARKET		
	High and Low-grades Combined	*Those with Agency Rating I–IV*	*Those with Market Rating Equivalent*
All industries	16.3%	12.3%	13.6%
Railroads	29.7	26.0	28.7
Public utilities	9.5	5.6	6.9
Industrials	17.2	13.3	13.1

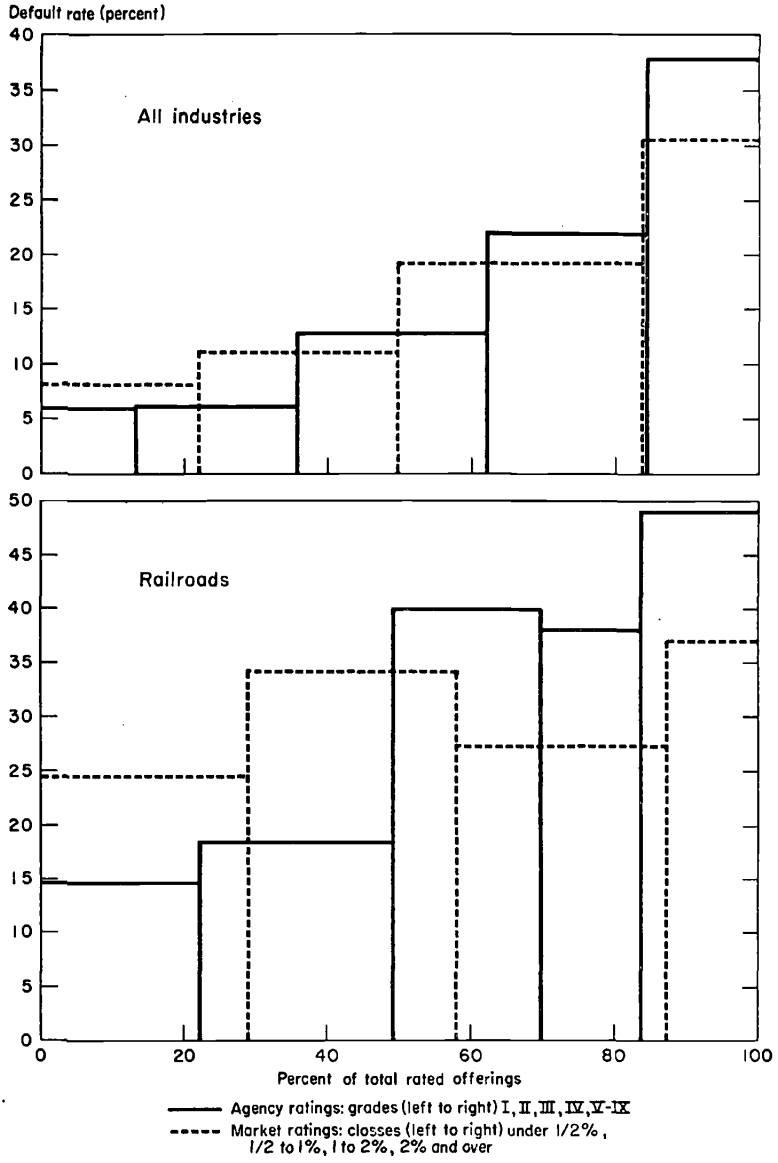
	OFFERINGS RATED BY BOTH LEGAL LIST AND MARKET		
	High and Low-grades Combined	*Those on Legal List*	*Those with Market Rating Equivalent*
		Maine	
All industries	12.0%	6.6%	5.5%
Railroads	29.9	29.7	23.7
Public utilities	8.2	0.1	0.8
Industrials	6.3	0.0	0.0
		Massachusetts	
All industries	16.8	8.8	8.8
Railroads	29.5	24.7	25.2
Public utilities	8.6	0.1	1.0
Industrials			
		New York	
All industries	14.4	8.9	5.8
Railroads	26.7	22.9	24.1
Public utilities	9.1	0.1	1.0
Industrials	0.0	0.0	0.0

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues and for 10 percent of small issues adjusted annually to universe totals, exclusive of offerings not rated by both of a given pair of rating systems. The default rates for the market-rating equivalents for all industries were computed without regard to industry composition. When recomputed by combining the totals of the component industry groups, the market-rating equivalents, in the several comparisons from top to bottom, are: 13.6 percent (agency ratings); 6.2 percent (Maine legals); 8.8 percent (Massachusetts legals); 10.5 percent (New York legals).

Some evidence on the question is brought together in Table 73, and more detailed data of the same general type are presented in Charts 20 through 23. The table presents life-span default rates for equally inclusive groups of high grades chosen from offerings during 1908–43, comparing the judgments of the agencies and the market on the one hand, and of the legal lists and the market on the other. Since the market-rating groups were determined by arraying all offerings during the full period studied in order of the yield spread at offering, the table shows the effects of applying a fixed yield-spread standard to offerings over a long span of years. Only offerings rated by both of two compared rating systems are included. The charts are similar except that they compare in detail the default rates by rating grade.

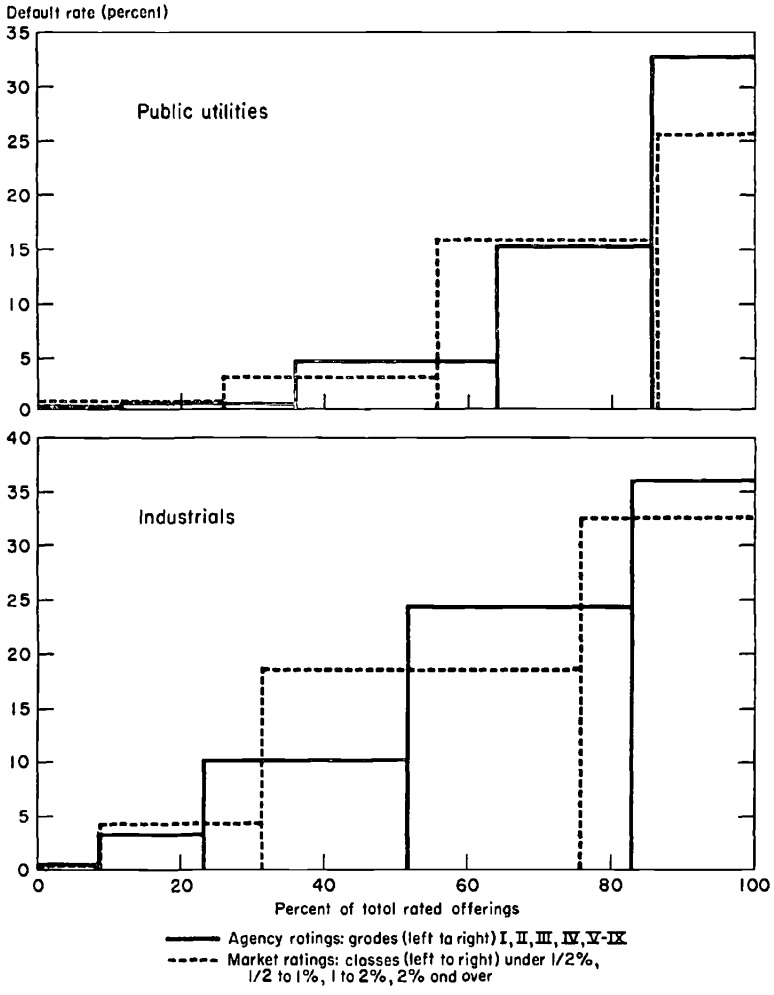
It appears from Table 73 that the agencies were more effective than the market in predicting life-span default risk at offering. Although the differences in the default rates are fairly small, they are clearly in favor of the agencies in the all-industry figures, and in railroads and public utilities as well. The same point is brought out in Chart 20. Since each panel of the chart covers only jointly rated offerings, lower default rates to the left of any given point (and higher default rates to the right of it) indicate a superior rating system. (A perfect system would separate all defaults from nondefaults; the graph would then be a step function, hugging the base line for the high grades and jumping to 100 percent for the low grades.) Although the agencies and the market were far from perfect in predicting default rates at offering, it is clear from the chart that the default rates for the agency selections were generally lower for the high grades and higher for the low grades than were the market ratings, showing that the agencies had the superior system. The chart shows also that the market was particularly inept in the case of rail offerings. As a matter of fact, the life-span default rates for the market-selected high grades of that industry differed but little from the over-all default rate for rails (see also Table 73), indicating that the market rating at offering was almost (but not quite) worthless as an indicator of the prospective quality of rail offerings. The principal explanation is that the market was excessively optimistic about rail offerings in the twenties (as subsequent high default rates were to prove) and was excessively depressed in the thirties (as subsequent low default rates were to show). The use of a fixed market-rating test at offering thus resulted in a perverse selection for rails. In the

CHART 20—Agency and Market Ratings Compared with Respect to Life-span Default Rates



From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were rated by one or more agencies: par-amount data for all large (straight) corporate issues rated both by the market and by at least one investment agency, and for 10 percent of such small issues adjusted annually to universe totals.

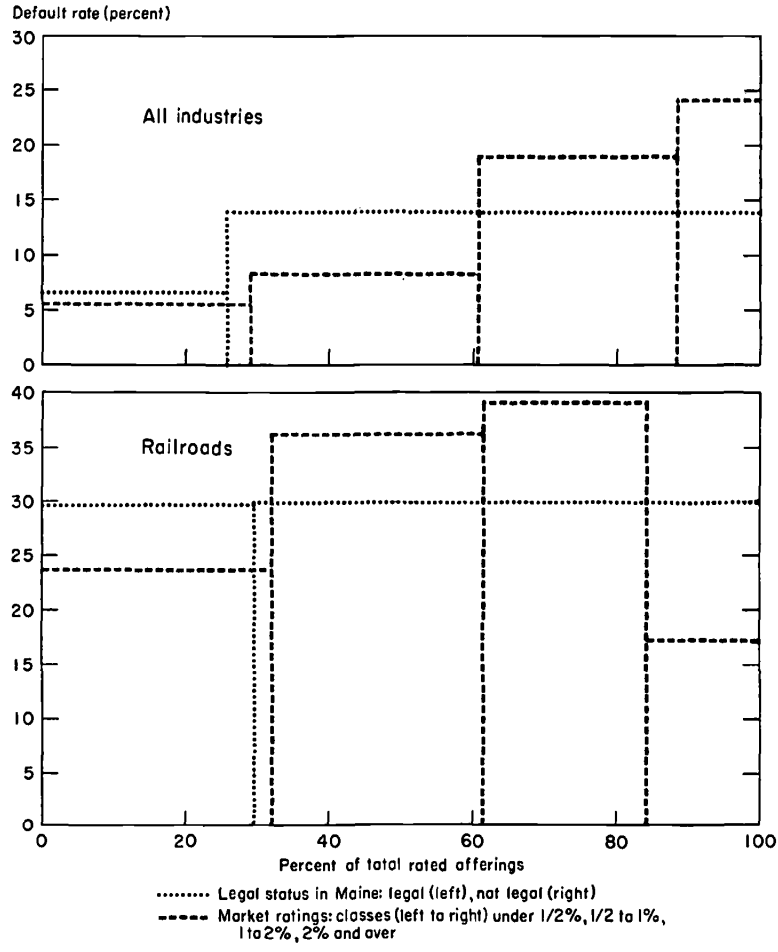
CHART 20, concluded



other two industry groups, the market and the agencies moved more nearly together, and the later default experience was less sharply contrasted; for utilities, the agencies had the better record, and for industrials the market had somewhat the better.

Since life-span default rates were lower for high grades selected by agency ratings than by market ratings, and since the reverse was true for default rates on outstandings over quadrennial periods, the question arises whether the apparent superiority of the

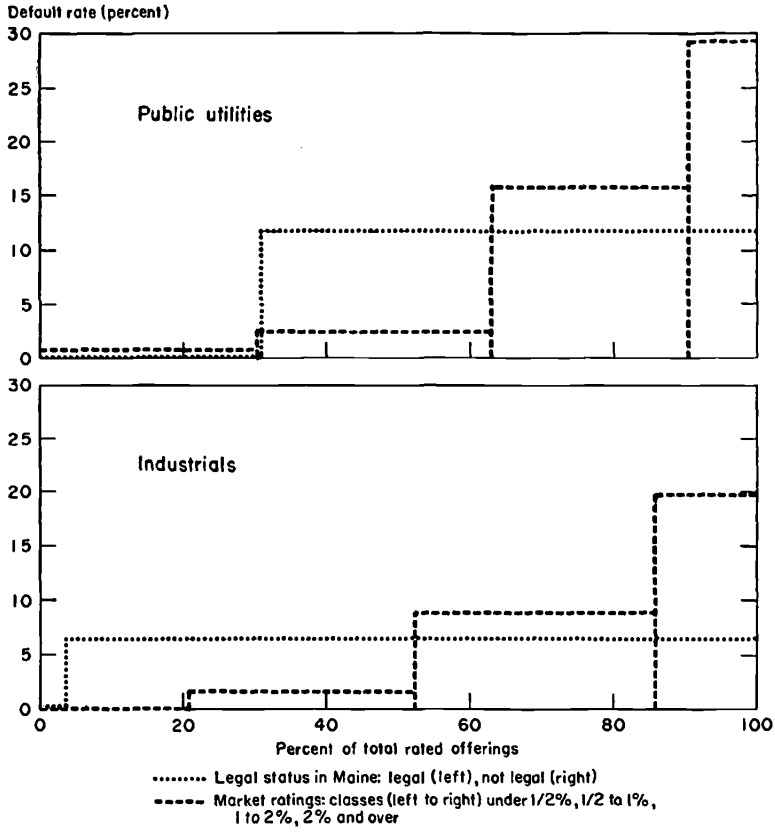
CHART 21—Legal Status in Maine and Market Rating Compared with Respect to Life-span Default Rates



From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the Maine legal list: par-amount data for all large (straight) corporate issues rated by the market as well as by the Maine regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals.

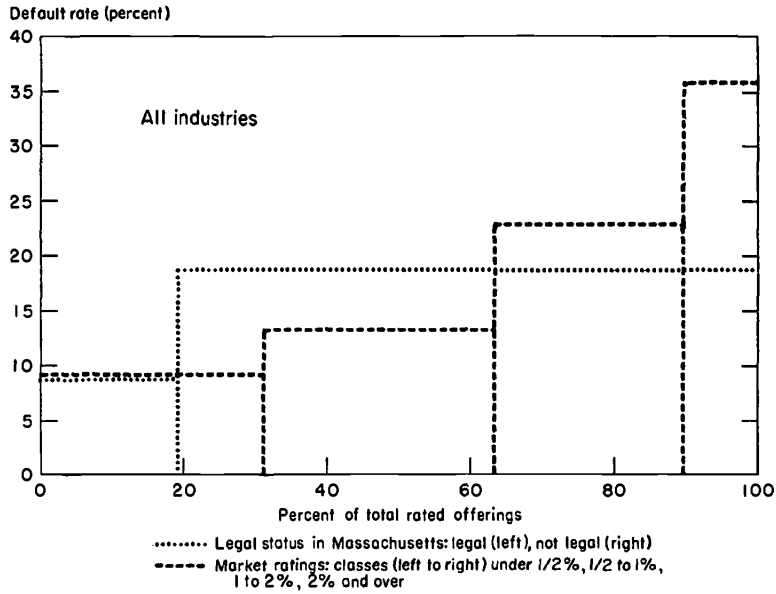
Note: In industrials the default rate was zero for legals and the market rating class under ½ percent.

CHART 21, concluded



agency ratings at offering was due simply to the instability of the market rating. To put the matter differently: Which was the better predictor of default risk at offering, after allowing for time shifts in the market rating? In attempting to answer this question, we conducted the experiment of selecting equivalent lists of offerings annually, thus in effect eliminating the influence of year-to-year shifts in the market rating. The results were fairly inconclusive; so far as they go, they were in favor of the market rating. Of the twenty-four years during 1920–43 for which comparisons were made, the default rates for offerings rated I–IV by the agencies were higher than for the equivalent market rating list ten times, were lower six times, and the two were tied eight times. The average of the twenty-four annual default rates was 10.3 percent for the

CHART 22—Legal Status in Massachusetts and Market Rating Compared with Respect to Life-span Default Rates

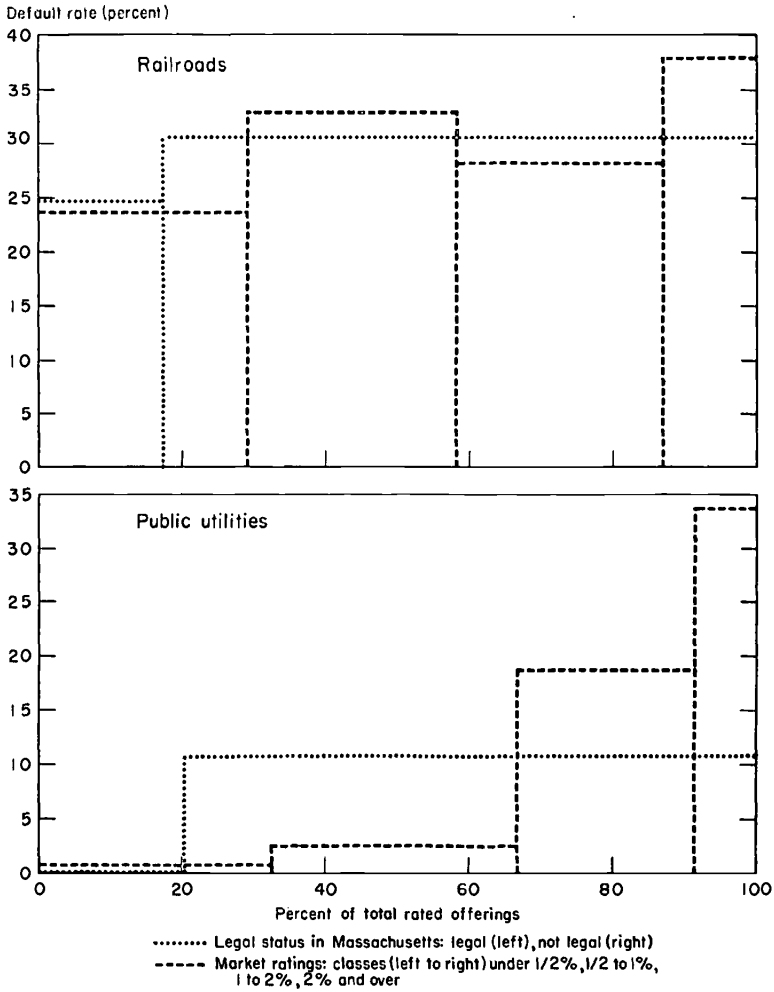


From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the Massachusetts legal list: par-amount data for all large (straight) corporate issues rated by the market as well as by the Massachusetts regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals.

agency ratings and 9.9 percent for the market ratings; and in the five-year periods 1920–24, 1930–34, and 1935–39 the average default rate for the market-rating equivalent was also lower, though not in 1925–29, when the market was excessively bouyant, nor in 1940–43, when neither group showed any defaults. There is thus some evidence that the market was a more efficient predictor than the agencies when applied to offerings or outstandings at a given moment of time. On the other hand, the market yardstick shifted, so that it was less efficient than the agency grade applied as an invariant standard over a long period.

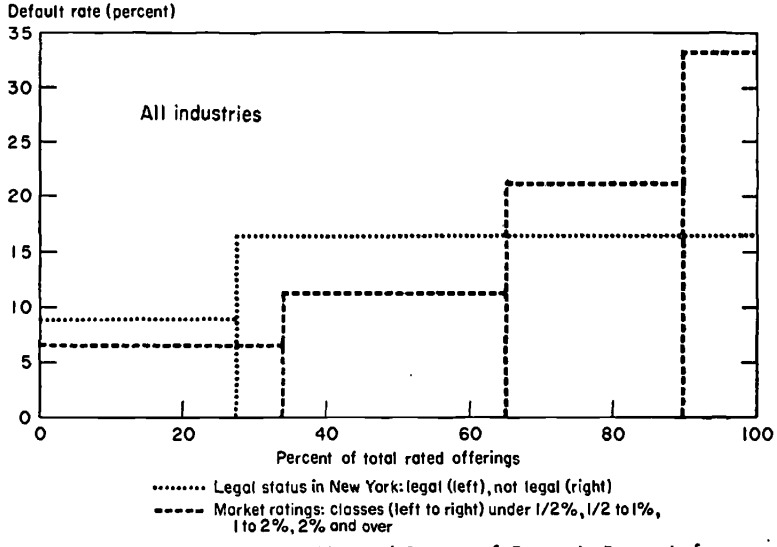
So far as the market and the legal lists are concerned, the evidence is generally in favor of the market for all issues combined, but in favor of the legal lists within major industry groups. Thus in Table 73, high grades selected by the market show lower default rates for all-industry groups than do Maine and New York

CHART 22, concluded



legals, and the same rate as Massachusetts legals, but show higher or tied rates for every industry subgroup except Maine rails. The explanation is the heavy weight given the rails by the legal lists in the all-industry figures and the heavy default incidence of the rail group. As Charts 21 through 23 indicate, both the market and the legal lists had poor records with respect to rail bonds at offering, but the market did not assign such an important place to the rails in its selection of high grades. Again, it seems

CHART 23—Legal Status in New York and Market Rating Compared with Respect to Life-span Default Rates



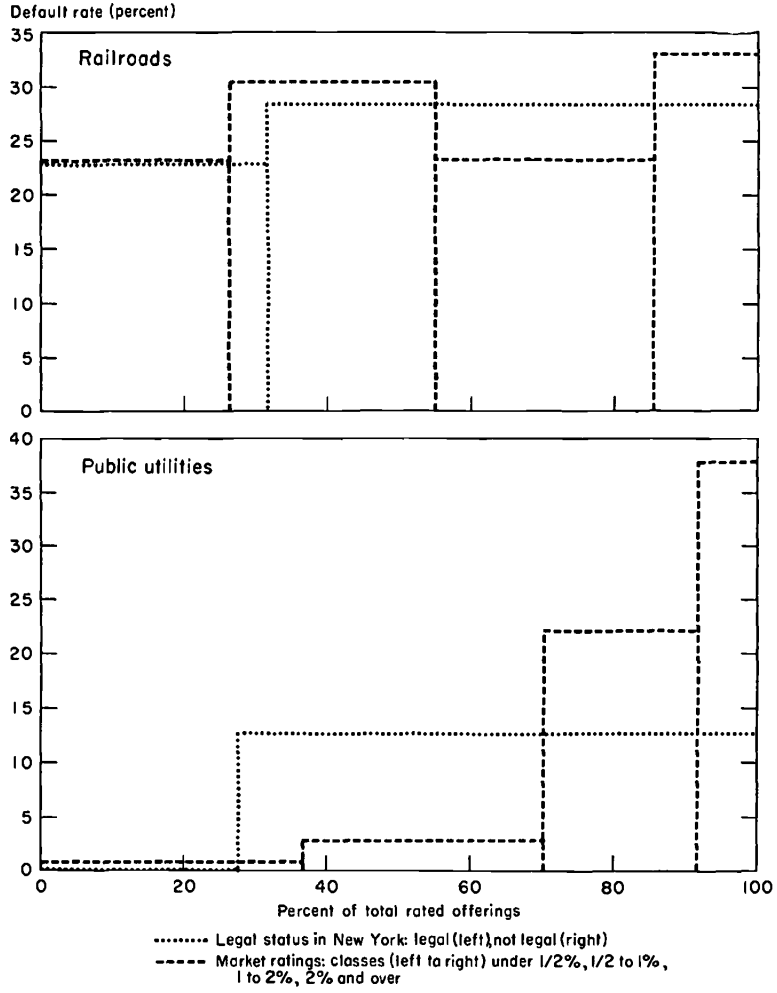
From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the New York legal list: par-amount data for all large (straight) corporate issues rated by the market as well as by the New York regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals. No defaults occurred on industrial issues offered in the years when such bonds were on the list.

likely that the record of the market was marred by its instability over time; but the point has not been explicitly tested by constructing annual equivalent lists.

Comparative Yields

Comparisons, in this section, of the yield experience of equally inclusive lists of securities rated high or low grade under the different rating systems cover assumed investment periods from offering to extinguishment and from beginning to end of eight-year and longer chronological periods. Since issues were not rated by most agencies during the first two decades of the present century, and since the legal lists were not published throughout most of that period (for Maine they did not appear until 1923), the analysis covers periods beginning January 1, 1920. The yield records are based on equivalent volumes of issues included in the experience samples and cover only issues rated by both of two given rating systems under examination.

CHART 23, concluded



Average life-span yields and loss rates on regular offerings of straight corporate bonds since 1920 are presented in Tables 74 and 75, in the first of which the composite agency-rating grade at offering, and in the second, the legal status at offering, is compared with the market rating. Table 74 indicates that the weighted average realized yield for the large offerings falling in the first four agency-rating grades was 5.3 percent, and that this average exceeded by 0.3 percent the weighted average realized yield of an equally inclusive list of offerings rated high grade by

the market. Analogous results were obtained for the small issues, with the average realized yield higher by 0.4 percent for issues rated I–IV at offering. The superior returns obtained on the agency selections were partly, but not entirely, the result of the higher yields promised at offering. As would be expected, the weighted average promised yields on the "best" issues selected by means of the market rating (i.e. issues with the highest offering prices and the lowest promised yields) were below those of equally inclusive lists of the best issues as defined by the agencies, but not sufficiently below to account fully for the differentials in realized yields. For the large issues, higher capital gains were obtained on the best bonds as rated by the agencies (0.5 percent) than on the corresponding group selected by the market (0.3 percent). Capital losses occurred generally on the smaller issues, but again the differential was in favor of issues rated I–IV by the agencies (an average loss rate of 0.3 percent for the I–IV's versus 0.5 percent for the market high grades). All of these results, except that for the difference between loss rates of small issues, are statistically significant.[2]

[2] The statistical significance of the results may be shown by comparing independent pairs of unweighted averages obtained by removal of all offerings rated as high grade under both rating systems. For example, of the 2,861 offerings of large issues in our experience sample that were appraised by both systems, 2,397 were rated high grade by both agencies and the market, leaving 270 rated high grade by the agencies and low grade by the market, and 194 rated high grade by the market and low grade by the agencies. The latter two samples are independent in a statistical sense, with sample means for the realized yields of 7.5 percent and 3.6 percent, respectively, and sample variances of 14.4 percent and 34.8 percent. Application of the standard large-sample test for the difference between means of independent samples shows that the difference was 8.09 times the estimated standard error of the difference, or far in excess of the critical value of 1.96 at the 5 percent significance level customarily employed in statistical comparisons of this type.

Of the 323 offerings in the small issues experience sample appraised by both systems, 55 were rated high grade by the agencies and low grade by the market, while 59 were rated low grade by the agencies and high grade by the market. The sample means of the realized yields were 6.8 percent and 4.9 percent, respectively, and the sample variances, 24.8 percent and 27.4 percent. In this case, the difference between means is smaller than for the large issues (2.01 times the estimated standard error of the difference) but again may be considered statistically significant. Moreover, since the result for the sample of small issues is independent of that of the sample of large, the combined result is highly significant in the statistical sense. Similar conclusions obtained from an analysis of the promised yields and loss rates verify the statements made in the text above. It should be noted that, for samples of the size employed here, the test for the difference between means is virtually "distribution-free," i.e. it is valid under most reasonable assumptions as to the characteristics of the underlying distribution functions, their parameters, etc.

TABLE 74—Life-span Yields and Loss Rates for Offerings with High and Low Agency Ratings at Offering and for Equal Volumes Rated High or Low by the Market, 1920–43

	LARGE ISSUES RATED BY BOTH SYSTEMS				SMALL ISSUES RATED BY BOTH SYSTEMS			
	Agency Rating I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*	*Agency Rating* I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*
Promised yield	4.8%	4.7%	6.6%	7.5%	6.0%	5.8%	6.7%	7.1%
Realized yield	5.3	5.0	4.4	7.2	5.7	5.3	5.7	6.5
Loss rate	−0.5	−0.3	2.2	0.3	0.3	0.5	1.0	0.6

Based on data for regular offerings in *Statistical Measures*, Table 185, and special supplementary tabulations covering issues in the offerings experience sample that were rated by the agencies (all of which, by the nature of the sample, had market ratings). Yields and loss rates are weighted averages with par amounts of included offerings as weights. For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year.

Table 74 also shows the experience on equally inclusive lists of low-grade issues (issues rated v–ix by the agencies) and their market-rating equivalents. As might be surmised from the way the averages were constructed, the behavior of low-grade bonds is complementary to that of high grades. For if an average yield (or loss rate) of top-grade issues under one rating system exceeds that of an equally inclusive list under a second rating system, then the average yield for low grades under the first system must necessarily fall below the average under the second.[3] We therefore conclude (and Table 74 verifies) that the weighted average promised and realized yields for issues rated v–ix were lower than those of the market-selected low grades and that the loss rate was higher, these relationships holding for both large and small issues. Again, the results are statistically significant (except for the difference between loss rates for small issues).[4]

The same point is made graphically in Chart 24, which shows the average yields and loss rates on regular offerings since 1920 in the individual rating classes. Promised and realized yields on regular offerings were more systematically related to market ratings than to agency ratings; that is, the two yields rose more rapidly for successively lower grades of bonds in the case of the market selections. It follows that promised and realized yields averaged lower for the very high-grade offerings under the market rating than under the agency rating, and that for the very low-grade offerings the reverse was true. Average loss rates were negative and about the same for offerings in each of the first four agency grades and for those in market-rating classes under 2 percent; but the positive loss rates for issues rated v–ix at offering were markedly higher than those for issues having market ratings of 2 percent or over.

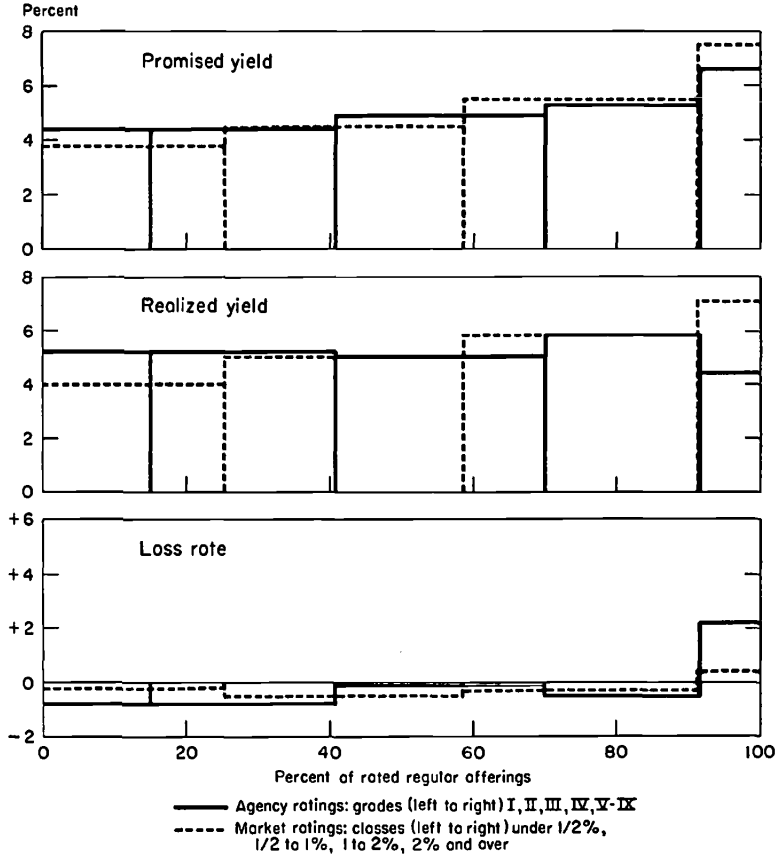
Comparable relationships (which, however, are not independent of those presented for the agency ratings) occurred among

[3] Since issues rated by both systems are the only ones considered, yield averages for the total list from highest to lowest grade under each system are identical. Then if the average for a given volume selected at one end of the quality scale from the differently rated lists is less for market-rated than for agency-rated issues, the average for the remainder must be greater for the market-rated than for the agency-rated group.

Actually the market ratings were not carried out to enough places to enable us to determine exactly equivalent lists, but the discrepancies are so small in Table 74 that the above relationship holds.

[4] The statistical significance of these results is an immediate consequence of the complementarity of the relationships among the averages for high- and low-grade issues and the fact that the differences between the averages for the high grades are statistically significant (cf. footnotes 2 and 3).

CHART 24—Agency and Market Ratings Compared with Respect to Life-span Yields and Loss Rates: Regular Offerings since 1920



From Tables 39 and 65: large issues since 1920, without adjustment to exclude the very few offerings for which yield information sufficed yet no agency rating was given.

the average life-span yields and loss rates for legal bonds and their market-rating equivalents (Table 75). For each state, and for each issue-size class except one, the weighted average life-span yield realized on legal bonds exceeded that of an equal volume of best bonds as rated by the market.[5] With the same one

[5] The single exception occurred in the case of small issues legal in New York State at offering. Because of the legal restrictions on size of obligor and

exception, the weighted average yield promised at offering was also higher on legal bonds, but not sufficiently so to explain the superior realized return. Thus, again, capital gains were lower on the market-rating equivalents than on the legal bonds. The inverse pattern of relationships is observed for large issues not legal at offering: the average promised yields, realized yields, and capital gains were lower (or capital losses higher) for nonlegals than for an equal volume of issues with the poorest market ratings.

The higher realized returns obtained on bonds legal or in the first four agency-rating grades at offering than on their market-rating equivalents result partly from the higher promised yields and partly from the market's tendency toward overoptimism in the 1920's. As Chart 4 and Table 17 show, the highest proportions of offerings that later defaulted occurred in 1927–30 and 1933. The market was clearly too optimistic in all of those years (except possibly 1933) and too pessimistic in many of the others. Of the 194 offerings of large issues rated high grade by the market but not by the agencies (see footnote 2) 62 percent, in number, were floated in 1927–30 and only 38 percent in other years. This contrasts with the 270 offerings designated high grade by the agencies but not by the market, of which only 6 percent were floated in the high-default years. As a result, only 21.1 percent of the number of offerings designated high grade by the agencies and low grade by the market, and 13.9 percent of their par amount, went into default, while the corresponding figures for the market's choice were 40.2 percent for number of offerings and 42.6 percent for par amount. On new offerings in each of the four-year periods 1920–23, 1924–27, and 1928–31 the subsequent default rates were lower for issues selected by the market than for those chosen by the agencies, but it is from the third of these periods, when default rates were extremely high for both groups, that the majority of the market's selections stem. The lower realized returns on the market-selected lists thus provide another illustration of the weakness of the market rating when applied as an invariant standard over a long period of years.

Similar analysis of the legal lists indicates that they too were less subject to waves of overoptimism and overpessimism than the

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of issue, the volume of regular offerings in the small issues sample eligible for savings bank investment in New York at offering, 1920–43, was negligible (only $8 million out of a possible $577 million). The exceptional behavior of the small legals in New York is thus of little practical consequence.

TABLE 75—Life-span Yields and Loss Rates for Offerings Legal or Not Legal in Maine, Massachusetts, and New York at Offering and for Equal Volumes Rated High or Low by the Market, 1920–43

	LARGE ISSUES RATED BY BOTH SYSTEMS			SMALL ISSUES RATED BY BOTH SYSTEMS		
	Promised Yield	*Realized Yield*	*Loss Rate*	*Promised Yield*	*Realized Yield*	*Loss Rate*
Maine						
Legal	4.0%	4.7%	−0.7%	4.6%	5.3%	−0.7%
Market rating equivalent	3.8	4.0	−0.2	4.4	4.9	−0.5
Not legal	5.2	5.3	−0.1	6.3	5.6	0.7
Market rating equivalent	5.3	5.6	−0.3	6.4	5.6	0.8
Massachusetts						
Legal	3.8	4.8	−1.0	4.7	5.3	−0.6
Market rating equivalent	3.6	3.9	−0.3	4.4	4.9	−0.5
Not legal	5.1	5.3	−0.2	6.3	5.6	0.7
Market rating equivalent	5.2	5.4	−0.2	6.4	5.6	0.8
New York						
Legal	4.0	4.6	−0.6	3.5	4.5	−1.0
Market rating equivalent	3.8	4.0	−0.2	4.6	4.7	−0.1
Not legal	5.2	5.3	−0.1	6.3	5.6	0.7
Market rating equivalent	5.3	5.6	−0.3	6.3	5.6	0.7

Based on data for regular offerings since 1920 in *Statistical Measures*, Table 188, and special supplementary tabulations covering issues in the offerings experience sample (all of which, by the nature of the sample, had ratings under both systems). Yields and loss rates are weighted averages with par amounts of included offerings as weights. For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year.

market; hence the average life-span yields realized on bonds legal at offering were above those of securities on equally inclusive lists selected by means of an invariant market rating at offering.

Futher information on the same subject is provided by Tables 76 and 77. The yields and loss rates of these tables are weighted averages of outstandings from the large issues experience sample, and compare differently selected groups of high- or low-grade securities held over assumed long chronological periods of investment. As before, each equivalent pair of lists includes the same par-amount total of outstanding issues at the beginning of the stated period. But here the equivalent lists were first constructed within each major industry grouping to eliminate industry differences in the proportion of issues assigned top quality by the respective rating systems and were then combined to form the all-industry totals. This means that the industry composition of each all-industry list selected by market rating is identical with that of the corresponding list selected by agency rating or legal status. For high-grade issues, comparison of the realized yields on the agencies' and the market's selections (Table 76) reveals that the differences are negligible, both for the combined industries and for the major industry components. This was to be partly expected because the proportion of issues rated high grade by the agencies is usually very large, so that there is much overlapping with the market's high grades. Sizable and more systematic differences appear for the low-grade issues. Since the low grades comprise a smaller proportion of the total par amount of outstandings than the high grades and there is less overlapping of included issues, the averages for low grades are more sensitive to differences in individual yields. Moreover, for reasons explained earlier (footnote 3) they are complementary to the averages for high grades; that is, when the average yield for issues rated V–IX falls below that of its market-rating equivalent, then the average yield for issues rated I–IV usually exceeds that of its equivalent. (The complementary relationship holds exactly only if yields and market ratings are carried out to a sufficient number of decimal places.) Thus, with allowance for rounding, the figures for low grades serve to magnify differences that may underlie the rest of the table. For each of the six periods, the weighted average realized yield for all issues rated V–IX fell below its market-rating equivalent, and the same was true in thirteen of the fifteen comparisons possible in the data for the industry components. Since the periods

are overlapping, the comparisons are not independent and it cannot be proved that the observed pattern is statistically significant. Nevertheless, the results are so one-sided as to leave little doubt that this was actually the case.[6]

The evidence of Table 77 covering legal status is similar to that for the agency ratings. Except for the New York list in 1920–27 and the Massachusetts and New York lists in 1924–39, the differences between the realized yields on legal bonds and their corresponding market-rating equivalents are quite small and offset each other. In this case the same is true of the yields of the lower grades. The industry breakdowns, which are not presented in the table, show that realized yields were typically higher for legals in Massachusetts and New York than for their market-rating equivalents, but the differences are small and not statistically significant.

We conclude that for outstanding issues held over selected chronological periods, differences in realized yields between high grades selected by agency rating or legal status and high grades chosen by the market were usually small and of doubtful practical significance. Nevertheless, systematic differences were observed in the yields for low agency grades and the market-rating equivalents, the latter frequently having the higher yields. This implies that small but systematic differences in the opposite direction would also be observed in the yields of the high grades, if carried out to a sufficient number of decimal places. Analogous but somewhat larger differences among yields were observed for issues held from offering to extinguishment, caused principally by the instability of the market rating over time, but influenced to some extent by the lower promised returns of the market-rating lists.

Tables 76 and 77 reveal several additional points of interest. Since a list arrayed in order of market rating is roughly arrayed in order of promised yield, a given volume of issues selected from the best market rating downward will usually have an average promised yield lower than the average for an equal volume of high grades selected by a different system from the same collectivity of issues. Because the legal lists were more restrictive than a list comprised of issues in the first four agency-rating grades,

[6] Certain pairs of periods are nonoverlapping, for example, 1920–27 and 1928–39, and also 1920–31 and 1932–39. For each pair of nonoverlapping periods, the realized yield for issues rated V–IX was exceeded by the market-rating equivalent in four out of five possible independent industry-size comparisons. The comparisons, however, are too few in number to permit a reliable statistical inference.

TABLE 76—Yields and Loss Rates over Eight-year and Longer Periods of Investment for Outstandings with High and Low Agency Ratings at Beginning of Periods and for Equal Volumes Rated High or Low by the Market; 1920–39

PERIOD	ALL INDUSTRIES				RAILROADS			
	Agency Rating I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*	*Agency Rating* I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*
				Promised Yield				
1920–27	6.4%	6.3%	9.6%	10.1%	6.4%	6.3%	10.0%	11.0%
1920–31	6.3	6.3	9.5	9.9	6.3	6.3	9.8	10.9
1920–39	6.1	6.1	9.3	9.6	6.1	6.1	9.8	10.2
1924–39	5.5	5.5	8.2	8.5	5.3	5.3	8.2	8.5
1928–39	4.8	4.8	6.2	6.5	4.5	4.5	5.6	5.8
1932–39	6.5	6.3	14.5	15.1	6.6	6.4	14.4	15.3
				Realized Yield				
1920–27	8.3	8.3	12.2	12.7	8.5	8.5	12.6	13.4
1920–31	5.9	5.8	7.9	8.8	5.5	5.5	7.0	8.1
1920–39	5.7	5.6	7.7	8.2	5.2	5.2	5.8	6.0
1924–39	5.1	5.1	5.0	5.4	3.9	3.8	1.6	2.0
1928–39	3.3	3.3	1.2	1.6	1.4	1.3	−4.3	−2.6
1932–39	6.8	6.7	9.0	9.4	4.8	4.5	−0.2	0.9
				Loss Rate				
1920–27	−1.9	−2.0	−2.6	−2.6	−2.1	−2.2	−2.6	−2.4
1920–31	0.4	0.5	1.6	1.1	0.8	0.8	2.8	2.8
1920–39	0.4	0.5	1.6	1.4	0.9	0.9	4.0	4.2
1924–39	0.4	0.4	3.2	3.1	1.4	1.5	6.6	6.5
1928–39	1.5	1.5	5.0	4.9	3.1	3.2	9.9	8.4
1932–39	−0.3	−0.4	5.5	5.7	1.8	1.9	14.6	14.4

TABLE 76
(concluded)

PERIOD	PUBLIC UTILITIES				INDUSTRIALS			
	Agency Rating I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*	*Agency Rating* I–IV	*Market Rating Equivalent*	*Agency Rating* V–IX	*Market Rating Equivalent*
				Promised Yield				
1920–27	6.7%	6.7%	9.4%	9.7%	5.9%	5.9%	[a]	
1920–31	6.7	6.6	9.3	9.6	5.9	5.9		
1920–39	6.6	6.5	9.0	9.2	5.6	5.6		
1924–39	5.9	5.9	8.1	8.4	5.7	5.7	8.5%	9.1%
1928–39	5.0	4.9	6.6	6.7	5.2	5.2	6.5	7.1
1932–39	6.2	6.1	13.9	14.4	7.3	6.9	15.4	16.0
				Realized Yield				
1920–27	8.6	8.5	12.1	12.4	7.0	7.0	[a]	
1920–31	7.2	6.9	8.4	9.1	5.9	5.9		
1920–39	7.3	7.0	8.8	9.5	6.3	6.3		
1924–39	6.7	6.7	8.0	8.2	6.6	6.6	7.5	8.2
1928–39	4.9	5.0	4.1	3.5	5.1	5.1	4.0	4.3
1932–39	8.2	8.2	13.7	13.9	9.7	10.1	17.1	16.5
				Loss Rate				
1920–27	−1.9	−1.8	−2.7	−2.7	−1.1	−1.1	[a]	
1920–31	−0.5	−0.3	0.9	0.5	0.0	0.0		
1920–39	−0.7	−0.5	0.2	−0.3	−0.7	−0.7		
1924–39	−0.8	−0.8	0.1	0.2	−0.9	−0.9	1.0	0.9
1928–39	0.1	−0.1	2.5	3.2	0.1	0.1	2.5	2.8
1932–39	−2.0	−2.1	0.2	0.5	−2.4	−3.2	−1.7	−0.5

From Table 166 of *Statistical Measures*, and special supplementary tabulations, covering large issues in the periodic experience sample that were rated by the agencies (all of which, by the nature of the sample, had market ratings). Yields and loss rates are weighted averages with par amounts of outstandings at the beginning of the relevant periods as weights.

[a] Only one issue included in sample, with promised yield 8.7 percent, realized yield −7.3 percent, and loss rate 16.0 percent.

TABLE 77—Yields and Loss Rates over Eight-year and Longer Periods of Investment for Outstandings Legal or Not Legal in Maine, Massachusetts, and New York at Beginning of Periods and for Equal Volumes Rated High or Low by the Market; 1920–39

	MAINE				MASSACHUSETTS				NEW YORK			
PERIOD	*Legal*	*Market Rating Equivalent*	*Not Legal*	*Market Rating Equivalent*	*Legal*	*Market Rating Equivalent*	*Not Legal*	*Market Rating Equivalent*	*Legal*	*Market Rating Equivalent*	*Not Legal*	*Market Rating Equivalent*
						Promised Yield						
1920–27					6.0%	5.6%	6.9%	7.3%	6.0%	5.4%	6.9%	7.1%
1920–31					5.9	5.5	6.9	7.1	6.0	5.4	6.8	7.1
1920–39					5.6	5.4	6.8	6.9	5.7	5.4	6.7	6.8
1924–39	5.2%	5.0%	6.1%	6.2%	5.0	4.9	6.0	6.0	5.0	4.9	6.0	6.0
1928–39	4.5	4.3	5.1	5.2	4.4	4.3	5.0	5.1	4.4	4.3	5.1	5.2
1932–39	5.7	5.2	9.3	9.6	5.7	5.2	8.9	9.2	6.0	5.6	9.6	9.9
						Realized Yield						
1920–27					7.9	7.6	9.0	9.3	8.0	7.3	8.9	9.1
1920–31					5.2	5.3	6.4	6.4	5.1	5.4	6.4	6.3
1920–39					5.2	5.1	6.2	6.3	5.1	4.9	6.2	6.2
1924–39	4.7	4.7	5.4	5.4	4.2	4.6	5.4	5.3	3.9	4.4	5.5	5.3
1928–39	3.1	3.1	3.2	3.1	3.2	3.3	3.1	3.1	3.1	3.1	3.2	3.1
1932–39	6.1	6.2	7.8	7.7	5.9	5.8	7.6	7.8	5.7	5.5	8.2	8.4
						Loss Rate						
1920–27					−1.9	−2.0	−2.1	−2.0	−2.0	−1.9	−2.0	−2.0
1920–31					0.7	0.2	0.5	0.7	0.9	0.0	0.4	0.8
1920–39					0.4	0.3	0.6	0.6	0.6	0.5	0.5	0.6
1924–39	0.5	0.3	0.7	0.8	0.8	0.3	0.6	0.7	1.1	0.5	0.5	0.7
1928–39	1.4	1.2	1.9	2.1	1.2	1.0	1.9	2.0	1.3	1.2	1.9	2.1
1932–39	−0.4	−1.0	1.5	1.9	−0.2	−0.6	1.3	1.4	0.3	0.1	1.4	1.5

Based on Table 169 of *Statistical Measures*, and special supplementary tabulations, covering large issues in the periodic experience sample (all of which, by the nature of the sample, had ratings under both systems). Yields and loss rates are weighted averages with par amounts of outstandings at the beginning of the relevant period as weights.

such differences are most pronounced for legal bonds. Among realized yields, on the other hand, the differences were small. As a result, the loss rates on the market-rating equivalents of the legal lists were systematically below those for legal bonds (or their capital gain rates were higher). Comparison of the corresponding pairs of rates indicates that this occurred in all three of the periods covered for Maine legals, in all six of the periods for Massachusetts legals, and in five of the six periods for New York legals. (The single exception was New York, 1920–27, when the capital gain rate for the legal list slightly exceeded the market-rating equivalent.) The likely explanation appears to be the higher intrinsic quality and lower default rates of outstandings selected by means of the market rating. Although promised yields were lower, loss rates were lower too, so that realized yields were about the same. The implication would seem to be that investors seeking to avoid defaults and those unable to set up adequate loss reserves would have improved their position by selecting issues on the basis of the market rating rather than from the legal lists.

No such systematic pattern of behavior is found when outstanding issues in the first four agency-rating grades are compared with their market-rating equivalents. Since these lists included such a large proportion of all outstanding issues, the differences among the average promised yields were negligible, and the same is true of the realized yields. Thus the average loss rates for equally inclusive groups of top-grade outstandings selected by agency rating and by market rating proved to be roughly similar.

Legal Lists versus Agency Ratings

To complete the round of comparisons of issues included in the three rating systems, Tables 78 through 80 bring together default rates and yields for the legal lists and for equally inclusive lists selected on the basis of agency ratings. The agency-rating equivalents in each case were constructed analogously to the market-rating equivalents of earlier tables of the chapter. For example, in constructing Table 78 we found that at the beginning of 1924, $1.5 billion par amount of public utility bonds or 24.9 percent of the total of rated utility outstandings that were not in default were eligible for savings bank investment in Maine. This was equivalent in volume to a list comprised of all outstanding public utility issues having composite rating grade I plus 51.0 percent of those rated II. To determine which of the latter group to include

TABLE 78—Quadrennial Default Rates for Outstandings Legal in Maine, Massachusetts, and New York at Beginning of Periods and for Equal Volumes of High Grades Selected by Agency Rating; 1912–43

PERIOD	ALL INDUSTRIES		RAILROADS		PUBLIC UTILITIES		INDUSTRIALS	
	Legal[a]	*Agency Rating Equivalent*	*Legal*[a]	*Agency Rating Equivalent*	*Legal*[a]	*Agency Rating Equivalent*	*Legal*[a]	*Agency Rating Equivalent*
				Legal in Maine				
1924–27	0.4%	0.0%	0.0%	0.0%	1.5%	0.0%		
1928–31	0.0	0.0	0.0	0.0	0.0	0.0		
1932–35	4.1	0.2	9.4	0.5	0.0	0.0	0.0%	0.0%
1936–39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940–43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Legal in Massachusetts				
1912–15	0.0	0.0	0.0	0.0	0.0	0.0		
1916–19	0.0	0.0	0.0	0.0	0.0	0.0		
1920–23	0.0	0.0	0.0	0.0	0.0	0.0		
1924–27	0.0	0.0	0.0	0.0	0.0	0.0		
1928–31	0.0	0.0	0.0	0.0	0.0	0.0		
1932–35	1.2	0.3	1.9	0.4	0.0	0.0		
1936–39	8.0	1.7	11.6	2.4	0.0	0.0		
1940–43	0.0	0.3	0.0	0.5	0.0	0.0		
				Legal in New York				
1916–19	0.0	0.0	0.0	0.0	0.0	0.0		
1920–23	0.0	0.0	0.0	0.0	0.0	0.0		
1924–27	5.3	0.0	5.3	0.0	0.0	0.0		
1928–31	0.1	0.0	0.1	0.0	0.0	0.0		
1932–35	5.8	4.0	8.0	5.6	0.0	0.0		
1936–39	4.3	3.4	5.9	5.4	0.0	0.0		
1940–43	0.0	0.3	0.0	0.5	0.0	0.0	0.0	0.0

From special tabulations of the National Bureau of Economic Research: par-amount data for all large (straight) corporate issues that were in good standing and rated by at least one investment agency, at beginning of respective periods, and for 10 percent of such small issues adjusted quadrennially to universe totals.

[a] Rates differ from those given in Table 48 in being based only on issues rated by the agencies.

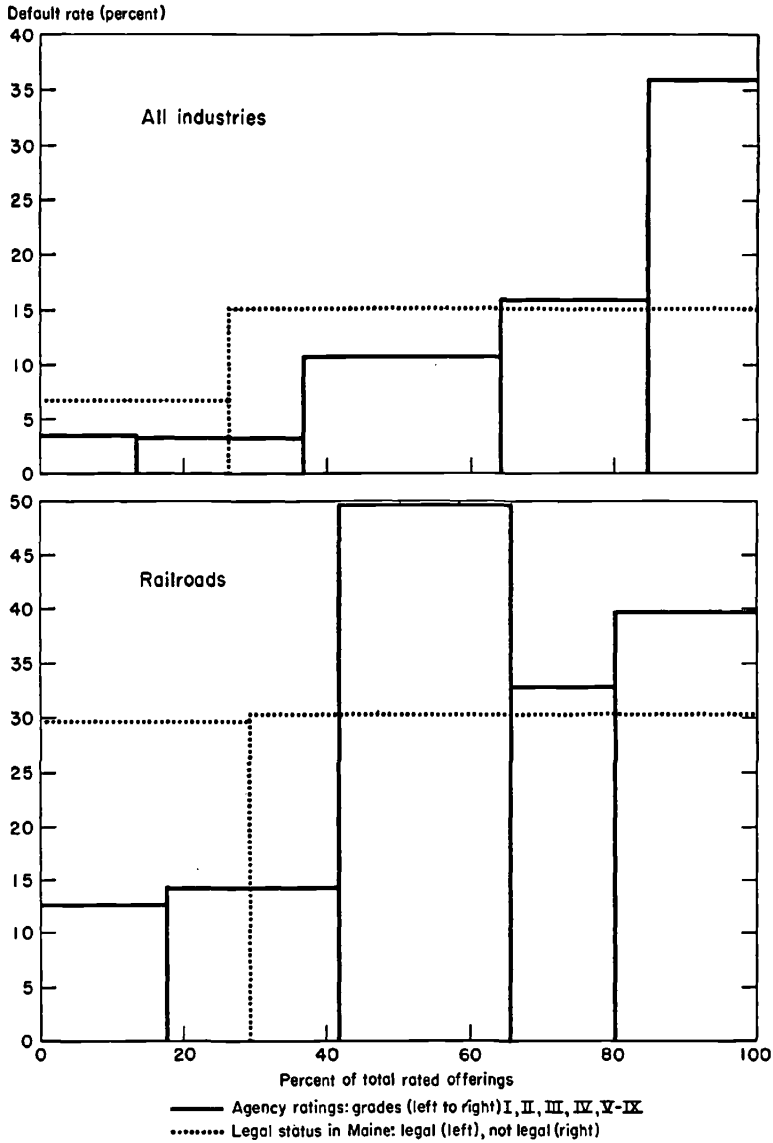
in setting up the agency-rating equivalents, we fell back upon the market rating. Thus all utility issues having composite grade II were ranked in ascending order by market rating, and the best 51.0 percent (those with narrowest yield spreads) were combined with issues rated I to obtain the agency-rating equivalent. During the subsequent four-year period, 1.5 percent of the par-amount total of legal utility bonds went into default, as against none of those on the agency list. For that period, therefore, the agency ratings (supplemented within grade by the market ratings) were more sensitive to impending utility defaults than the Maine legal list.

Comparative Safety

Table 78 shows that the records of both the legal lists and the agencies were excellent with respect to sensitivity to impending default over short periods, so that non-zero default rates occurred in only ten cases within the industry groups. For eight of these, the quadrennial default rate was lower for the agency list than for the legals, which might be expected from the fact that the ratings can be revised upward or downward more quickly than the legal lists. On the other hand, the ten comparisons are not independent, since each legal list includes issues common to the others. In other words, the results for the quadrennial periods suggest a tendency toward superiority for the agency ratings, although it has not been possible to check this by a standard statistical test.

Similar comparisons with respect to life-span default rates are made in Charts 25 through 27, with results that support and amplify the quadrennial data. For each state, the life-span default rate for legal bonds of the combined industries is above that of the more inclusive group of issues rated I and II by the agencies, showing that agency rating equivalents necessarily had lower default rates than the legal lists. And by the same token, since the volume of legal offerings was less inclusive than that of issues rated I or II by the agencies, it would have been possible over the period studied to select a larger volume of given quality (i.e. of offerings with a given default rate) by means of the agency ratings. Legal public utilities had excellent default records, but so, too, did the top two agency grades, which included a larger proportion of the total volume of utility offerings. For rails the results are similar to those observed in these charts for all industries. Legal rails had a

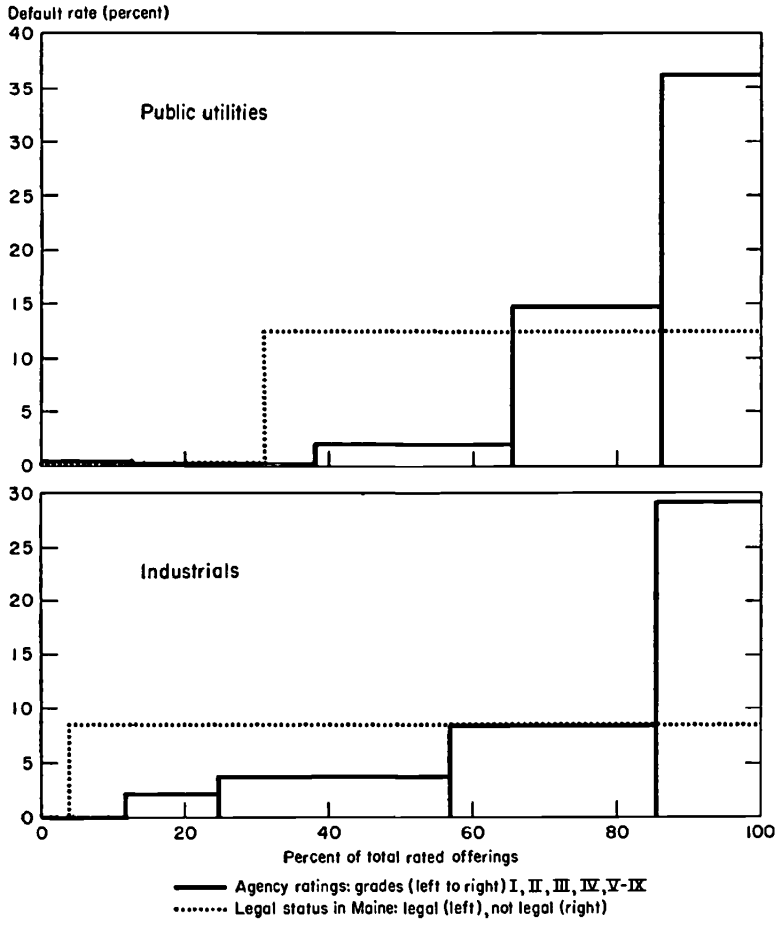
CHART 25—Legal Status in Maine and Agency Rating Compared with Respect to Life-span Default Rates



From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the Maine legal list: par-amount data for all large (straight) corporate issues rated by at least one investment agency as well as by the Maine regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals.

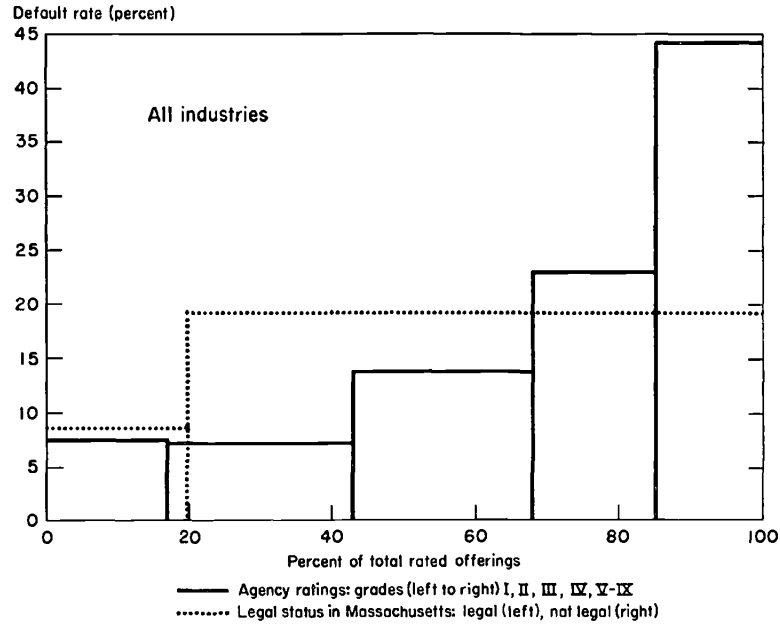
Note: In industrials the default rate was zero for legals and agency rating grade I.

CHART 25, concluded



very poor record, with default rates not much better than those of the nonlegals. Uniformly, rail offerings in the top two agency rating grades had lower default rates than the legals and comprised a larger proportion of total rail offerings. We conclude that agency ratings were more efficient predictors of default risk than the legal lists over the entire life span from offering to extinguishment, and were probably slightly more efficient in predicting default rates on outstandings held over shorter chronological periods.

CHART 26—Legal Status in Massachusetts and Agency Rating Compared with Respect to Life-span Default Rates

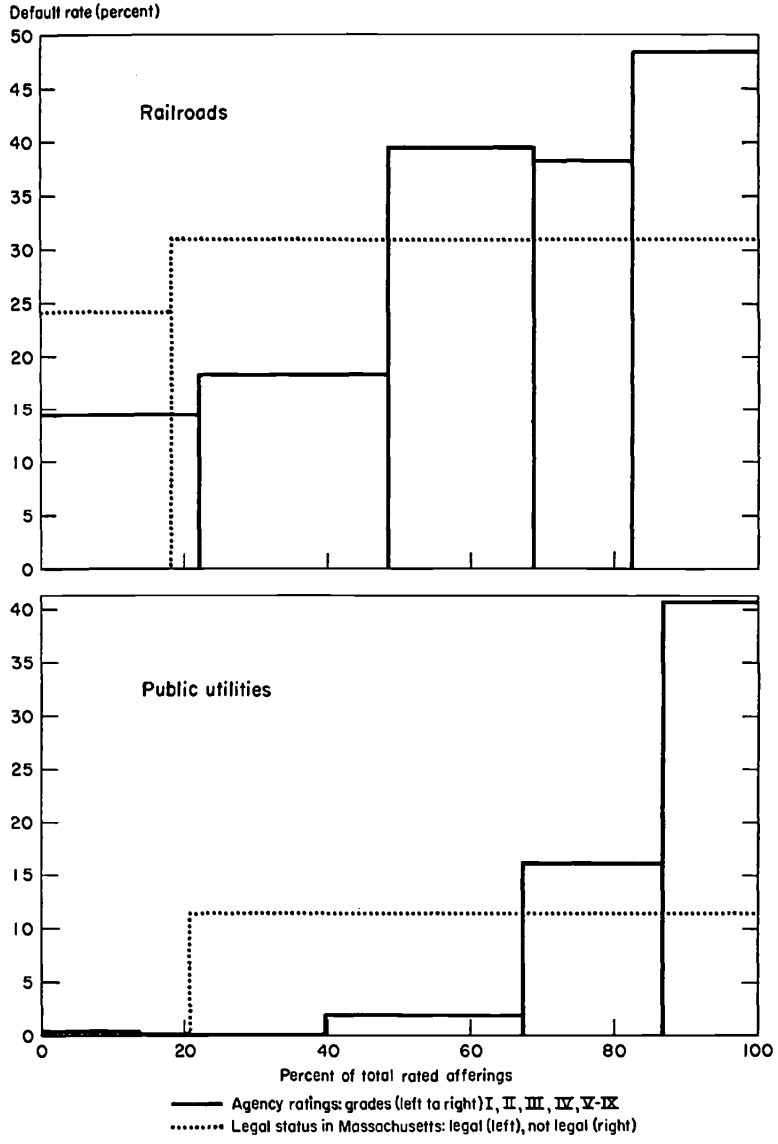


From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the Massachusetts legal list: par-amount data for all large (straight) corporate issues rated by at least one investment agency as well as by the Massachusetts regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals.

Comparative Yields

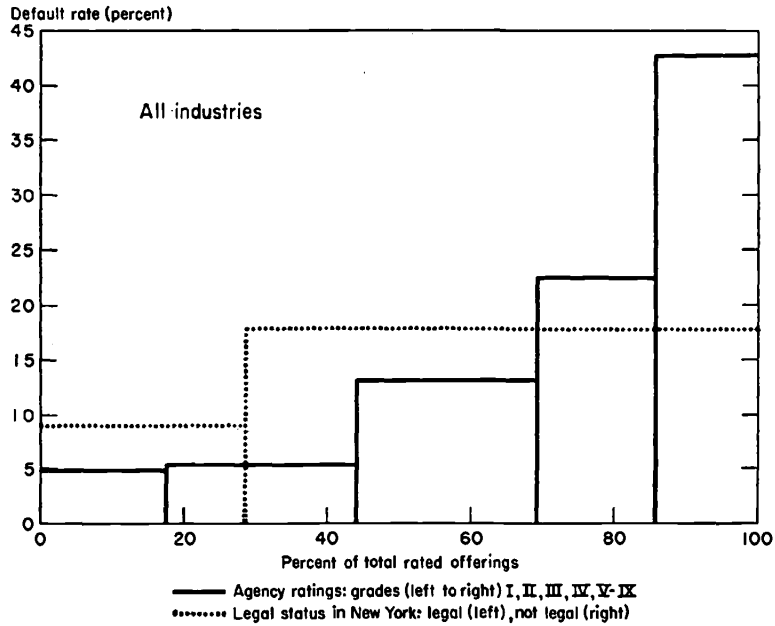
Tables 79 and 80, which compare yields and loss rates on legal bonds and on their agency-rating equivalents, can best be discussed together. Table 79 covers experience over the full span from offering to extinguishment, and Table 80, experience over eight-year and longer chronological periods. The former is affected by the falling trend of interest rates over the period 1920–43 and by the fact that approximately 60 percent of the par amount of offerings legal in each of the three states appeared in the last nine years of that period, while offerings in the equivalent agency rating groups were spread more uniformly over the years. The effect of this unevenness is that in four of the six comparisons in Table 79, legal bonds had lower promised yields at offering than equally inclusive lists of the best bonds as rated by the agencies. This con-

CHART 26, concluded



trasts with Table 80, in which the promised yields on outstanding legals are uniformly higher than on their agency-rating equivalents. As a check on this point, agency-rating equivalents were selected annually for large issues legal at offering in Massachu-

CHART 27—Legal Status in New York and Agency Rating Compared with Respect to Life-span Default Rates



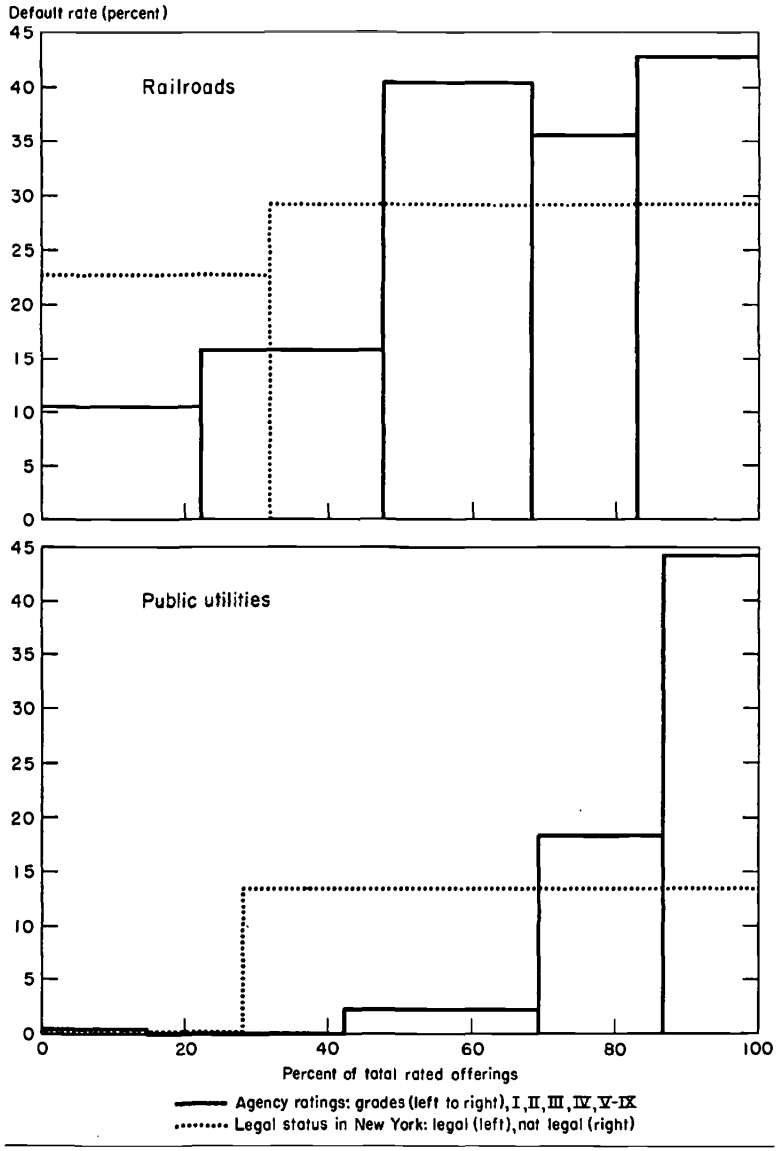
From special tabulations of the National Bureau of Economic Research for years when bond issues in the given industry groups were included on the New York legal list: par-amount data for all large (straight) corporate issues rated by at least one investment agency as well as by the New York regulatory authorities, and for 10 percent of such small issues adjusted annually to universe totals. No defaults occurred on industrial issues offered in the years when such bonds were on the list.

Note: In public utilities the default rate was zero for agency rating grade II.

setts. The average promised yield was found to be 3.7 percent for the agency-rating equivalent selected on this basis, as against 4.0 percent for the Massachusetts legals, a result that agrees with Table 80 rather than Table 79.[7]

[7] Actually, special tabulations show that among outstanding issues within the same agency-rating grade, legals generally sold to yield somewhat less than nonlegals, as would be expected from the fact that the legal lists channel investment funds into a narrowly restricted field. The explanation for the results in Table 80 and in the test run for Massachusetts offerings is that the average quality of legal bonds judged by agency-rating grade is necessarily lower than (or equal to) that of an equally inclusive list of the best bonds on the agency list itself, and that some of the lower-rated bonds have higher promised yields. Our supplementary use of the market rating in selecting the agency high grades did not appreciably affect the results. The point was tested

CHART 27, concluded



by sacrificing the equality of the volumes compared, and in this way obviating the need for a supplementary rating. That is, where the volume of agency high grades equal to the corresponding volume of legals in Table 80 included but a part of agency grade II (for example), the agency-rating equivalent was recomputed with all grade II bonds included. Average promised yields nevertheless remained higher for legals than for agency high grades.

We conclude, therefore, that not too much significance should be attached to the yield comparisons of Table 79 obtained from offerings data, although they do suggest that the differences between the average realized yields of legals and their agency-rating equivalents were small, with neither type of list having a marked

TABLE 79—Life-span Yields and Loss Rates for Offerings Legal or Not Legal in Maine, Massachusetts, and New York at Offering and for Equal Volumes with High or Low Agency Ratings; 1920–43

	LARGE ISSUES RATED BY BOTH SYSTEMS			SMALL ISSUES RATED BY BOTH SYSTEMS		
	Promised Yield	*Realized Yield*	*Loss Rate*	*Promised Yield*	*Realized Yield*	*Loss Rate*
Maine						
Legal[a]	4.0%	4.9%	−0.9%	4.6%	5.3%	−0.7%
Agency rating equivalent	4.1	4.8	−0.7	4.6	5.0	−0.4
Not legal	5.2	5.3	−0.1	6.4	5.7	0.7
Agency rating equivalent	5.1	5.3	−0.2	6.4	5.8	0.6
Massachusetts						
Legal[a]	4.0	4.7	−0.7	4.7	5.1	−0.4
Agency rating equivalent	4.3	5.1	−0.8	4.6	5.0	−0.4
Not legal	5.1	5.3	−0.2	6.3	5.7	0.6
Agency rating equivalent	5.0	5.2	−0.2	6.4	5.8	0.6
New York						
Legal[a]	4.0	4.5	−0.5	3.5	4.4	−0.9
Agency rating equivalent	4.1	4.8	−0.7	4.6	4.7	−0.1
Not legal	5.2	5.4	−0.2	6.3	5.7	0.6
Agency rating equivalent	5.1	5.3	−0.2	6.3	5.7	0.6

From special tabulations of the National Bureau of Economic Research covering regular offerings of issues in the offerings experience sample that were rated by at least one investment agency. Yields and loss rates are weighted averages with par amounts of included offerings as weights. For issues still outstanding on January 1, 1944 liquidation is assumed at prices prevailing in the first quarter of that year.

[a] Rates may differ from those given in Table 51 because based only on issues rated by the agencies.

TABLE 80—Yields and Loss Rates over Eight-year and Longer Periods of Investment for Outstandings Legal or Not Legal in Maine, Massachusetts, and New York at Beginning of Periods and for Equal Volumes with High or Low Agency Ratings; 1920–39

	MAINE				MASSACHUSETTS				NEW YORK			
PERIOD	*Legal*	*Agency Rating Equivalent*	*Not Legal*	*Agency Rating Equivalent*	*Legal*	*Agency Rating Equivalent*	*Not Legal*	*Agency Rating Equivalent*	*Legal*	*Agency Rating Equivalent*	*Not Legal*	*Agency Rating Equivalent*
						Promised Yield						
1920–27					6.0%	5.5%	6.9%	7.1%	6.0%	5.4%	6.9%	7.0%
1920–31					5.9	5.5	6.9	7.0	6.0	5.4	6.8	7.0
1920–39					5.6	5.4	6.8	6.9	5.7	5.4	6.7	6.8
1924–39	5.2%	5.1%	6.1%	6.2%	5.0	4.9	6.0	6.1	5.0	4.9	6.0	6.1
1928–39	4.5	4.4	5.1	5.2	4.4	4.3	5.0	5.0	4.4	4.3	5.1	5.1
1932–39	5.7	5.2	9.3	9.5	5.7	5.2	8.9	9.0	6.0	5.6	9.6	9.8
						Realized Yield						
1920–27					7.9	7.4	9.0	9.2	8.0	7.3	8.9	9.0
1920–31					5.2	5.3	6.4	6.4	5.1	5.4	6.4	6.3
1920–39					5.2	5.0	6.2	6.3	5.1	5.0	6.2	6.2
1924–39	4.7	4.6	5.4	5.4	4.2	4.3	5.4	5.4	3.9	4.2	5.5	5.4
1928–39	3.1	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.3	3.2	3.1
1932–39	6.1	6.4	7.8	7.6	5.9	6.1	7.6	7.6	5.7	5.6	8.2	8.3
						Loss Rate						
1920–27					−1.9	−1.9	−2.1	−2.1	−2.0	−1.9	−2.0	−2.0
1920–31					0.7	0.2	0.5	0.6	0.9	0.0	0.4	0.7
1920–39					0.4	0.4	0.6	0.6	0.6	0.4	0.5	0.6
1924–39	0.5	0.5	0.7	0.8	0.8	0.6	0.6	0.7	1.1	0.7	0.5	0.7
1928–39	1.4	1.1	1.9	2.2	1.2	1.2	1.9	1.9	1.3	1.0	1.9	2.0
1932–39	−0.4	−1.2	1.5	1.9	−0.2	−0.9	1.3	1.4	0.3	0.0	1.4	1.5

From special tabulations of the National Bureau of Economic Research, covering large issues in the periodic experience sample that were rated by the agencies. Yields and loss rates are weighted averages with par amounts of outstandings at the beginning of the relevant period as weights.

superiority to the other. The same mixed pattern appears in Table 80 for realized yields over eight-year and longer chronological periods. In seven of the fifteen possible comparisons, the realized yields were higher for the legals than for the corresponding agency-selected list, and in the remaining eight comparisons the reverse was true. On the other hand, since the promised yields on legal outstandings were uniformly higher (15 excesses in 15 comparisons), the loss rates were also usually higher (10 excesses and 4 ties in 15 comparisons). These results are confirmed by the test run for Massachusetts offerings. The average life-span yield realized on Massachusetts legals was 4.7 percent, and the yield was similar (4.6 percent) on the agency-rating equivalent selected on an annual basis. On the other hand, since the yield promised on Massachusetts legals at offering was higher, the average capital gain rate was lower. These results also tend to support Table 80 rather than Table 79.

To summarize, the quadrennial default rates (when not zero) were lower in most cases for lists selected on the basis of agency ratings (supplemented by market ratings) than for outstandings eligible for savings bank investment in the states studied, and the same is true of the life-span default rates from offering to extinguishment. Promised yields on legal outstandings were usually higher than on the agency-rating equivalents, but since the loss rates over eight-year and longer chronological periods of investment were also higher, the realized yields had a mixed pattern. Many of the differences observed throughout this section are small, and are of doubtful practical significance.